Space Weather Forecast

Issued on Thursday, 18 May 2023 at 13:03 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate radio blackouts from Moderate-class X-ray flares likely. Confidence in continuation of quiet geomagnetic conditions now lower.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity rose to moderate once again through the past 24 hours, with X-ray activity registering a step-change upwards from low-Common class prior to 17/1500UTC to instead show occasional mid Common-class and above thereafter. The peak flares of the period were a trio of low-end Moderate class, generated from an arriving sunspot region on the northeastern solar horizon - at 18/0626UTC, 18/0655UTC and 18/1147UTC. This arriving sunspot group was one of up to eight on the current Sun.

The most significant regions now on the facing side both lie near the eastern solar horizon, with the group that gave the large Moderate-class flare on 16 May more stable since - lying south of the new arrival (mentioned above).

Other spots on the Sun were less noteworthy, although there was a period of growth observed in three regions nearer the centre-west of the facing side into the current UTC day. All remaining regions were either magnetically unipolar or else decaying simple dipoles.

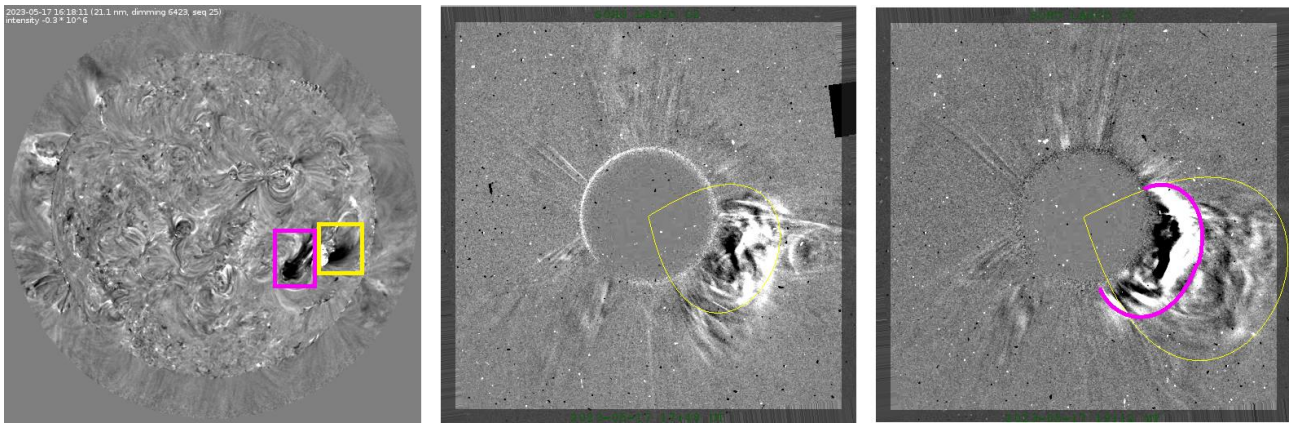

Figure 1: Left: Time-integrated extreme UV 'dimmings' showing two CME-generating events undergoing assessment at the time of writing (processing courtesy SIDC ROB). The resultant CME cones can be seen in the centre and right images. The 'filament'-related event (magenta) is the more likely to have produced an Earth-directed component (from its inferred lift-off location being nearer the middle of the facing side), although this has yet to be confirmed in modelling.

The current Sun is crowded with 'filaments' - arcs of plasma that can become Coronal Mass Ejections (CMEs) should they lift off with enough impetus. These have proved one of the main

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monitoring points in the past 24 hours. Given current satellite imagery, potentially the most notable event(s) took place in the southwest from around 17/1500UTC, with activity in an apparently minor sunspot group here but also its hitherto straddling filament. This manifested on subsequent imagery as a pair of CMEs, apparently seen heading largely south and ahead of the track of the Earth in its orbit. Having said this, the second of the two appears to be faster, and perhaps with more risk of carrying some form of Earth-directed component from at least the surrounding shock (where the CME influences the surrounding interplanetary environment - like a bow wave on a ship). Numerous analyses have been conducted and the latest results are awaited, however very provisionally some minor (possibly Minor Storm G1) influence is perhaps possible later in the four-day forecast period.

The remaining roster of events included: a high latitude northeastern filament at 17/1830UTC, with no ejecta subsequently visible. Also observed was a slow disappearing filament from the southeast-central part of the Sun around 17/2100UTC, which appears to have been re-absorbed (to no effect). Thirdly, a prominence eruption was observed from the northwestern limb 18/0300UTC, which is not expected to affect Earth; and finally a slow disappearing filament circumscribing the southern solar pole faded away from 18/0400UTC, with no obvious ejecta.

Confidence in the slate remaining clean for Earth-directed CMEs has fallen significantly by virtue of the above, however none are as yet confirmed in modelling.

Solar Wind / Geomagnetic Activity: The solar wind speed has now begun to relent in its stubborn occupancy of slightly elevated levels, falling from early highs to finally cross into background levels. This may be a final exit from tenuous high latitude 'coronal hole' fast wind. The number of particles comprising the solar wind and their associated magnetic field were both stable and small-scale.

The net result of the above solar wind measures was for quiet geomagnetic activity throughout.

Energetic Particles / Solar Radiation: Solar radiation showed a continued slow decline in the wake of 16 May's large proton-producing Moderate class flare from behind the eastern solar horizon, having peaked at 0.8pfu - i.e. roughly ten times below S1 for this energy level.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to be Moderate, with a slight chance of Strong-class X-ray flares, arising mainly from the arriving combination of eastern solar horizon spots. No significant regions leave the Sun in the period, and no further large regions are expected to arrive, leading to a level risk throughout.

Solar Wind / Geomagnetic Activity: No CMEs currently feature in the forecast, however confidence in this assertion is low, with modelling results awaited. Any resulting CME influence would be more likely later in the period given the modelled speeds.

The sole fast wind due in the period is mooted for onset on Friday 19 May, continuing through 20 May before waning. This may offer a token slight chance of G1 - the peak of the period should no CME influence materialise.

Energetic Particles / Solar Radiation: Solar radiation carries a daily Slight Chance of passing S1 levels, largely as a result of the eastern hemisphere spots, with this very gradually rising over the four days as they migrate westwards.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	10	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	60	60	60
Very Active	R3 to R5 X	No	15	15	15	15

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	15	15
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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